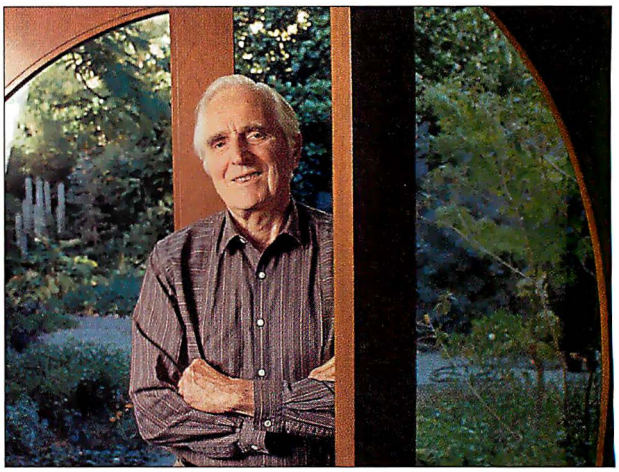
Dreaming of the Future

Digital technology could help make this a better world. But we've also got to change our way of thinking.



DAVID TOERGE © 1995

Despite the rapid progression of computing technology, the world faces incredible hazards as we enter a common economic-political vehicle, traveling at an ever-accelerating pace through increasingly complex terrain. Our headlights are much too dim and blurry, and we have totally inadequate steering and braking controls.

Many years ago, I dreamed that digital technology could greatly augment our collective human capabilities for dealing with complex, urgent problems. Computers, high-speed communications, displays, interfaces—it's as if suddenly, in an evolutionary sense, we're getting a super new nervous system to upgrade our collective social organisms. I dreamed that people were talking seriously about the potential of harnessing that technological and social nervous system to improve the collective IQ of our various organizations.

Then I dreamed that we got strategic and began to form cooperative alliances of organizations, employing advanced networked computer tools and methods to develop and apply new collective knowledge. Call these alliances NICs (Networked Improvement Communities). This seemed eminently sensible. The new technologies could enable much more effective distributed collaboration, and the potential for shared risk and multiplied benefits seemed promising.

In the dream, the solution involves giving high priority to the collective capability for a distributed community (or organization) to develop, integrate, and apply new knowledge. We already had this capability, of course; organizations handle new collective problems all the time. But yes, it would be nice if we could be a lot more effective at it. In the dream, this collaborative capability was called CoDIAK, for Concurrent Development, Integration, and Application of Knowledge.

Sounds great. The better we get, the better we get at getting better. Call it bootstrapping. And just think of the important role for technologists.

Although exciting new technology innovations have indeed been introduced within the NICs, the technology efforts have been overshadowed by the concurrent efforts in "human-system" innovation. This includes new skills, methods, collaborative organizational structures, telecommuting, knowledge-worker teams, distributed goal setting, planning and management processes.

One of the ideas computer-oriented folks have contributed is the open hyperdocument system. For this to make a difference, we must shed our outdated concept of a document. We need to think in terms of flexible jumping and viewing options. The objects assembled into a document should be dealt with explicitly as representations of kernel concepts in the authors' minds, and explicit structuring options have to be utilized to provide a much enhanced mapping of the source concept structures.

The Web/HTML (Hyper ext Markup Language) publishing-browsing landslide has moved steadily toward a highly structured, object-oriented architecture with integrated editor-browser tool sets. But his needs to become the way the majority of people do all their work. Draft notes, E-mail, plans, source code, to-do lists, what have you—all can be hyperdocument pieces, instantly and intrinsically linkable, and with work processes involving fewer and fewer hard-copy printouts.

It has been exciting to watch the emergence of total-quality management, process reengineering, NII (National Information Infrastructure), the World Wide Web, and so for h. But it pains me hat we haven't yet put up an explicit CoDIAK target, nor explored how NICs could fly. Since the first of these dreams got fixed in my head, decades ago, I've struggled with the realization that the sooner the world gets serious about pursuing the possibilities, the greater the chance that we can reduce the hazards facing this careening vessel carrying us along.

If the dream of improving human destiny doesn't move people, how about the thought that the companies that adopt the best CoDIAK-improvement strategy will have a significant competitive advantage. Wouldn't you want your group to have the highest collective IQ?

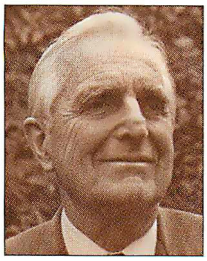
I confess that I am a dreamer. Someone once called me "just a dreamer." That offended me, the "just" par ; being a real dreamer is hard work. It really gets hard when you start believing in your dreams. ■

As a researcher and inventor in the late 1950s and early 1960s, Douglas Engelbart envisioned most of the computing concepts we now take for granted (see the brief biography on page 137). He heads the Bootstrap Institute. You can reach him by sending E-mail to engelbart@bootstrap.org.

of our top 20, is the latest wunderkind to compile. What Steve Jobs was to the desktop, Andreessen is to the Internet. His Netscape Navigator (née Mosaic) for PCs, Macs, and Unix machines already accounts for more than half of all Web browsing. He led the development of the prototype while he was an undergraduate at the University of Illinois. Unlike some of the other wunderkind (whose names we won't mention), Andreessen graduated from college.

■ Bill Atkinson

If you knew the Lisa like Bill Atkinson knew the Lisa, then you knew a lot more about the Lisa than most of us wanted to know. But from this scarlet woman, named for Steve Wozniak's daughter, came a GUI. Atkinson was the chief wizard behind its graphics engine. The Lisa begat the Mac, and the rest is history. Today, as cofounder of Apple spin-off General Magic, Atkinson wants to create technology that he hopes will be welcomed into people's lives, rather than be a source of stress—technology like MagicCap. We also fondly recall that he



DOUG ENGELBART

GRACE MURRAY HOPPER

was the chief designer of HyperCard, the software construction kit that put Mac programming tools into the hands of millions of Mac users.

■ Tim Berners-Lee

If the snobs who whine about the Internet's exploding popularity ever form a vigilante posse, the first man they'll hang is Tim Berners-Lee. He's the guy behind the World Wide Web, which he developed for the CERN (European Council for Nuclear Research) in Geneva, Switzerland, so that physicists could swap data easily. Berners-Lee developed the URL, HTML, and HTTP standards, from which he wove the Web. Since launching the Web in 1991, he has often endorsed the idea of people using it for profitable transactions. He's now at MIT, where he directs the World Wide Web Consortium, which deals with Web security and other issues. He deserves a Nobel prize of some sort.

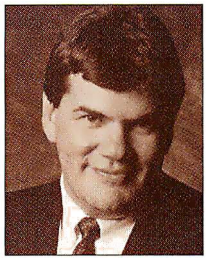
■ Doug Engelbart

Got patent envy? You'll have a hard time matching this pioneer, who holds 20, most of which are on basic features in microcomputing. Imagine microcomputing without windows; or word processing; or hypermedia, E-mail, and groupware; or the Internet. Imagine microcomputing without Doug Engelbart, now 70, who for years was a fixture at Stanford Research Institute. Engelbart had a vision that computers could be more than giant adding machines; they could be tools for human beings. A few years ago, he founded the Bootstrap Institute, dedicated to getting companies to collaborate on innovation. Comparisons with Thomas Edison do not seem

farfetched, which reminds us: He's best known for the first mouse—a wooden rodent invented in 1963.

■ Grace Murray Hopper

As a child, Grace Murray Hopper liked to take apart alarm clocks. She was the first woman to earn a doctorate in math at Yale. In World War II, she joined the Navy and was assigned to its computational center at Harvard. Amazing Grace later developed the first compiler for Remington Rand's UNIVAC in the early 1950s and led the charge to create COBOL. The Navy recalled her in 1967, and she was on active duty until 1986. She died in 1992 at the age of 85 with the rank of rear admiral. Anyone who met her could not help but be awe-struck by this diminutive fire storm of a human being. One pictures her stuck in purgatory, refusing to enter Heaven until St. Peter agrees to computerize. With a Lucky Strike hanging from her lip, she fires at the grand saint: "Beg your pardon, Sir, but your excuse, 'We've always done it this way,' is the most damaging phrase in the language."



PHILIPPE KAHN

DREW MAJOR

■ Philippe Kahn

French swagger, German determination, jazz artistry—must be Philippe Kahn. This software swashbuckler writes great compilers, plays David against Microsoft's Goliath, and never bores us. The son of a German father and a French mother, Kahn grew up in Paris. He studied Pascal with Niklaus Wirth, took a degree in math, earned money playing jazz, and developed applications on an Apple II. But Pascal compilers were too slow, so he wrote Turbo Pascal. Then he marketed it. With only $2000 in his pocket, he landed in the U.S. with no green card and no job. He founded Borland International in an office over an automobile repair shop in 1983. Despite the humble abode, Kahn convinced a BYTE ad salesperson to accept on credit a full-page color ad for Turbo Pascal. At a ridiculous $49.95, Kahn was swamped with orders.

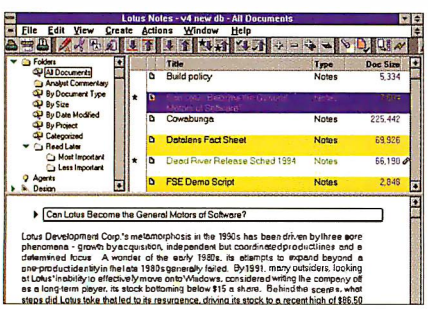
■ Mitch Kapor

"Software has been very, very good to me," Mitch Kapor once said. And, we add, Mitch Kapor has been very, very good to software. In 1982, he founded Lotus Development and, with Jonathan Sachs, created Lotus 1-2-3. Dan Bricklin invented the electronic spreadsheet (VisiCalc), but Kapor turned it into a more powerful, yet friendly, business tool. Lotus 1-2-3 remains the world's most widely used application. Given IBM's takeover of Lotus, it's interesting to note that Kapor once tried and failed to interest Big Blue in an exclusive marketing deal for 1-2-3. He left Lotus in 1986. In 1990, he cofounded the Electronic Frontier Foundation, a nonprofit group dedicated to understanding the social impact of the digital revolution.

Top 20 Technologies

Faster Faster

ETHERNET, DISK DRIVES, MICROPROCESSORS, RAPID APPLICATION DEVELOPMENT



The mind of the corporation, the soul of reengineering: Groupware.

Evolving standards will make DSP application development easier, while general-purpose OSes, including Windows 95, are expected to include DSP programming interfaces, which could push DSPs further into traditional markets. In the future, digital hard drives will likely rely on DSP-powered drive controllers to process signals from the disk.

■ Floppy Disks

Like the proverbial 2-cent bolt that can ground a 767, how could we have worked without the lowly floppy disk? It has given us an inexpensive way to distribute applications and data. Floppies also gave unconnected workgroups "sneakernets," inelegant but essential hacks in the pre-networked world. The Internet, WANs, and CD-ROMs may be cutting into the floppy's territory. And the world probably already has enough floppies in circulation—we just need to reformat all the disks stashed in desk drawers and file cabinets. But before you think floppies are obsolete, break the shrinkwrap on Microsoft's Office Professional 4.3: The collection of programs is still available on 31 disks.

■ Software Components

How do you implement custom applications quickly and not bust your operations budget? Plug in a component—those reusable, binary software objects that extend OSes by addressing specific needs. For Windows and the Mac, there are already OCXes (OLE controls); and components are also reshaping the various implementations of Unix and OS/2.

■ The Mouse

Like God and Man touching fingertips in Michelangelo's *Creation*, no other peripheral has done more to symbolically link computers with our humanness. Forget touch-typing or even hunt and peck; the mouse provided a way for computers to become accessible for millions of people. The original design dates back to the Stanford Research Institute and Douglas Engelbart's 1963 wooden prototype. In 1982, Mouse Systems introduced the first commercial mouse (a three-button design) for the IBM PC. The Apple mouse, originally for the Lisa, and Microsoft's mouse, with two buttons, came a year later. Today, the basic structure of interacting with our computers, whether Macintosh, Windows, or Unix, hinges on the mechanical or optical strains of this peripheral.

■ GUIs

The second component in humanizing how we interact with computers, modern GUIs trace their roots to PARC (Palo Alto Research Center) research and the Xerox Star. GUI features introduced successfully in 1984 with Apple's Macintosh (e.g., windows, point-and-shoot menus, program and file icons, dialog boxes, and other now-familiar elements) let us manage our electronic desktops to suit our individual desires.

■ Hard Drives

The peripheral that taught us that too much is never enough. The fixed disk drive became a staple of microcomputers, thanks to its fast data access and transfer speeds. The technology never stood still. We're now getting gigabytes of storage space in petite form factors. In recent years, hard drives have increased data densities at an annual rate of about 60 percent. Magnetoresistive heads are leading the next charge by providing greater areal density than thin film or ferrite-inductive heads. Lower seek times, caching optimizations, and higher spin rates push performance even more. In the future, the digital read channel may double the amount of information we can jam onto drive platters.

■ Laser Printers

These fast, trusty machines have done more to impede the paperless office than any other peripheral. Once laser beams began to transfer images into toner on a

SPECIAL ISSUE

BYTE

THE MAGAZINE OF TECHNOLOGY INTEGRATION

SEPTEMBER 1995

20 YEARS

best COMPUTERS

top PROGRAMS

biggest TECHNOLOGIES

most influential PEOPLE

plus!

Weirdest Error Messages
Worst Bugs
Amazing Hacker Feats
AND MORE...

A Publication of the McGraw-Hill Companies/0360-5280

BYTE

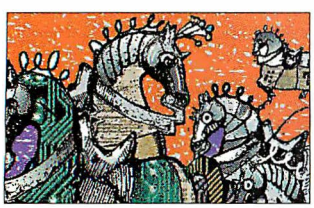
SEPTEMBER 1995 VOL. 20, NO. 9

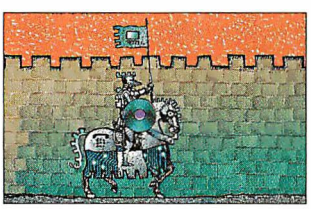
SPECIAL ISSUE

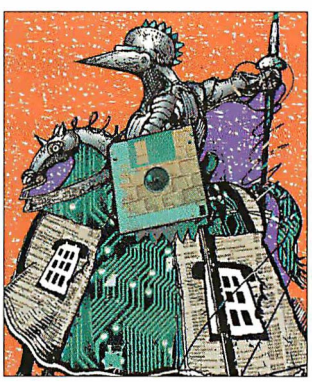
Features

THE BYTE NETWORK PROJECT

State of the Art







News & Views

Reviews

Core Technologies

Opinions

PROGRAM LISTINGS

FTP: ftp to ftp.byte.com

From BIX: Join "listings/frombyte95" and select the appropriate subarea (i.e., "sep95."

From the BYTE BBS at 1200-9600 bps: Dial (603) 924-9820 and follow the instructions at the prompt.

Bulk Rate
US Postage
PAID
McGraw-Hill

Third class mail enclosed, edition codes: W1C, W1D, W1E, W1F, W1G

BYTE (ISSN 0360-5280) is published monthly by McGraw-Hill, Inc. U.S. subscriber rate $29.95 per year. In Canada and Mexico, $34.95 per year. European surface mail subscriptions $60, airmail $85. Non-European subscriptions, $60 surface mail or $85 airmail. All foreign subscriptions are payable in U.S. funds that can be drawn on a U.S. bank. Single copies $3.50 in the U.S., $4.50 in Canada. Executive, Editorial, Circulation, and Advertising Offices: One Phoenix Mill Lane, Peterborough, NH 03458. Second-class postage paid at Peterborough, NH, and additional mailing offices. Postage paid at Winnipeg, Manitoba. Canada Post International Publications Mail Product Sales Agreement No. 246492. Registered for GST as McGraw-Hill, Inc., GST #123075673. Printed in the United States of America. **Postmaster**: Send address changes and fulfillment questions to BYTE Subscriptions, P.O. Box 552, Hightstown, NJ 08520.